TABLE 2

HAEMAGGLUTINATION-INHIBITING ANTIBODIES AND NEUTRALIZING ANTIBODIES AGAINST INFLUENZA A2/Hong Kong/1/68 IN OLD PEOPLE BEFORE AND AFTER VACCINATION WITH INACTIVATED VACCINE PREPARED WITH INFLUENZA A2/Netherlands/65 AND B/Netherlands/66

Test	Virus	No. of cases	No. of prevaccination sera showing:		No. of post-vaccination sera showing the following rises in antibody titre:		
			Antibodies present	Antibodies not present	None	2-fold	⩾4-fold
Haemagglutination inhibition	A2/Hong Kong/1/68	49	33	16	21	18	10
Neutralization	A2/Singapore/4/57	16	5	11	4	5	9
	A2/Hong Kong/1/68	16	10	6	6	5	5
	A/Equi-2/France/3/65	13	5	8	13	0	0

10 of 16 sera obtained from old people. Vaccination with an inactivated virus vaccine prepared from A2/Netherlands/65 and B/Netherlands/66 viruses induced an increase of antibodies against the A2/Hong Kong/68 virus (a 4-fold or greater rise in HI antibodies was found in 10 of 49 sera, and a similar rise in neutralizing antibodies was found in 5 of 16 sera). No case of A2/Hong Kong influenza occurred in this group.

In spite of these observations, the discrepancies in epidemic prevalence in different countries remain unexplained.

Experience with A2/Hong Kong Influenza Infections in US Military Personnel *

by ROBERT O. PECKINPAUGH, MAX J. ROSENBAUM & EARL A. EDWARDS

The first sizeable outbreak of Hong Kong influenza in the USA occurred among marines at the Drill Instructor School, San Diego, Calif. during 2–6 September 1968.[a] Clinical data and specimens were collected by US Navy Preventive Medicine Unit No. 5. Of a group of 49 marines 22 reported mild symptoms of acute respiratory disease. Only 3 were febrile and none required hospitalization. All symptoms disappeared within 24–48 hours after the onset of illness.

Nine strains of the Hong Kong influenza virus were isolated from 22 throat swab specimens. The antigenic relationship of 1 isolate (San Diego/249) to other strains of influenza A2 virus is shown in Table 1. The data indicate that there has been considerable antigenic drift away from the 1957 strain (A2/Japan/305/57) during the past 11 years. The 1967 strain (A2/Ann Arbor/67) seems to occupy an intermediate position between those strains isolated prior to 1967 and the recent Hong Kong variety. However, these data do not suggest that the Hong Kong strain is sufficiently different from the antecedent strains to warrant its reclassification as a new subtype (A3).

Table 2 shows the results of haemagglutination-inhibition (HI) tests on paired, acute and convalescent sera from 16 patients involved in the San Diego outbreak and in a later occurrence (26–30 September) of influenza-like disease in sailors aboard the aircraft carrier *USS Kitty Hawk*. Several strains of

* From Naval Medical Research Unit No. 4, Great Lakes, Ill., USA.

[a] *Morbidity and Mortality Weekly Report* 1968, **17**, 357.

TABLE 1
RESULTS OF HI TESTS ON INFLUENZA A2 VIRUS STRAINS

Antiserum [a]	HI titre to the following antigens:				
	A2/Japan/305/57	A2/Japan/170/62	A2/Taiwan/64	A2/Ann Arbor/67	A2/San Diego/249/68
A2/Japan/305/57	640	2 560	1 280	160	80
A2/Japan/170/62	320	1 280	160	160	40
A2/Taiwan/64	160	320	640	80	40
A2/Ann Arbor/67	320	1 280	1 280	2 560	320
A2/San Diego/249/68	80	80	160	320	640

[a] Rooster antisera treated with receptor-destroying enzyme.

TABLE 2
SEROLOGICAL RESPONSES OF PATIENTS TO VARIOUS INFLUENZA A2 ANTIGENS:

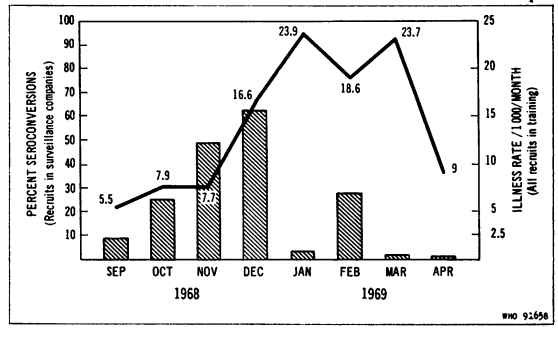
Status of patients [a]	Geometric mean HI antibody titre against the following antigens:			
	A2/Japan/305/57	A2/Japan/170/62	A2/Taiwan/64	A2/San Diego/249/68
Acute	180	120	150	17
Convalescent	800	960	640	140
Patients showing seroconversion	11/16 (69%)	13/16 (81%)	13/16 (81%)	13/16 (81%)

[a] The number of patients tested was 16. All sera were treated with receptor-destroying enzyme.

influenza A2 antigens were employed for comparison. There was no difference in the number of seroconversions (4-fold or greater antibody titre increases) to the A2/Japan/170/62, A2/Taiwan/64 or A2/San Diego/68 antigens. Of the 16 subjects, 13 (81%) had significant antibody titre increases with these antigens, but only 69% showed seroconversions against the older A2/Japan/305/57 antigen. However, there is a considerable difference in the magnitude of geometric mean HI antibody titres between the A2/San Diego/249/68 strain and earlier strains. Titres to the latter antigens are 7–11 times those to the A2/San Diego/249 strain. This is probably due either to previous vaccinations with influenza A2 antigens, which are mandatory for all military personnel, or possibly to a residual response of previous infection. Nevertheless, these pre-existing elevated antibody titres did not prevent infections with the recent Hong Kong strain, although the resultant illnesses may have been modified.

The accompanying figure shows the results of tests of paired sera from Navy recruits at Great Lakes, Ill., who were under surveillance from September 1968 to April 1969. The data for each

HONG KONG INFLUENZA AND ACUTE RESPIRATORY DISEASE RATES IN NAVY RECRUITS, GREAT LAKES, ILL., 1968–69



month represent HI antibody tests conducted on paired sera from approximately 50 men. The percentages of seroconversions between serum specimens obtained at the beginning, the middle, and the end of the 8-week training periods are shown on the left ordinate. The right ordinate shows the acute respiratory disease rates for all recruits in training during the months listed.

The serological data (histogram) show that influenza infections began in the late summer of 1968 and reached a maximum (63%) during December. The rate declined sharply in January and remained low until the end of April 1969.

The illness rate (curve) appeared to follow the increase in influenza infection but remained relatively elevated even after such infections declined. This was probably due to the presence of adenovirus type 4 infections (not shown) in this population at this time.

It should be pointed out that the number of influenza infections in the survey populations does not necessarily reflect their extent in the over-all recruit population. Men in survey companies do not receive influenza vaccinations upon entry into training, as do most of the other recruits, and merely serve to monitor the base-line of such infections. Also, the peak illness rate (24/1000 men per month) is considered low for this population during the winter season.

However, the surveillance serological data do indicate that the opportunity for a large outbreak of influenza in recruits was present at this time. The fact that it did not occur may be attributed to the fact that 75% of this population were immunized with a vaccine containing strains sufficiently related to the Hong Kong challenge virus to provide protection against influenza disease. These data are also consistent with the mild illnesses observed in the San Diego and *Kitty Hawk* influenza outbreaks in men who had also received such prior influenza immunizations.